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# The macroeconomic determinants of cross-country efficiency in wealth maximization: A joint analysis through the SFA and GMM models

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ABSTRACT

*In the arena of economic analysis, the wealth of a nation is getting more and more attention to be a better indicator to evaluate the status of an economy. This paper had studied the aggregate household wealth of different nations of the world, 106 countries, for the year 2009-2018. During these years, only two countries of the world, China and the USA, have managed to increase their wealth tremendously over the last decade while others experienced a slow pace in the growth of wealth. To satisfy the query of how efficient these countries were in maximizing their wealth, a stochastic frontier approach (SFA) has been used to predict the technical efficiency dependent variable and then generalized methods of moments (GMM) and other models have been used to find out the determinants of this efficiency. The study had come up with the result that land, labor, and capital mainly contributed to the output of wealth maximization while past year level of efficiency, export, and import played the main roles in determining the wealth maximizing efficiency status of a nation. It is found that there is a negative relationship between past-year efficiency with current years and the more a country imports, the less efficient the country is while the more it exports, the more efficient the country is in maximizing wealth.*



## Introduction

A specific national indicator to understand the status of an economy is still lacking in perfectness. In most literature, large amounts of information relevant to economic evaluation do not show up. Many don't because it's difficult even to obtain the relevant data, but others don't because they haven't been called for by the principle and practice of economic evaluation. Across the countries of the world interest for "green" national account has emerged lately in view of developing wave. Contemporary national accounts are inconclusive for economic assessment. In this situation, the goal of economic evaluation should be based on broad status of National Wealth of an economy not GDP nor Human Development Index. Wealth is the social value of the capital stock of an economy, which includes i) manufactured capital (ii) human capital (iii) natural capital. Certainly, the notion of capital assets today refers to organizations, information, community, faith, and even standards and practices. In fact, even intangible assets are assets and are considered as social infrastructure in which the more grounded capital assets are allocated and used (Dasgupta, 2013).

The assets term generally refers to the financial and non-financial resources available in the balance sheet to an organizational entity or business. In the balancing element, net cost, these assets are summarized. Wealth is characterized as the value of all assets owned by an organizational unit or business, less the value of all of its outstanding commitments. The amount of non-financial assets and net claims on the rest of the world are often referred to as national wealth for the economy as a whole (Durand, 2008). Adam Smith (1776) challenges the mercantile view in his book The Wealth of Nations that a nation becomes wealthier as its gold and silver stocks increases. He claims that a nation's wealth is determined not by its stock of precious metals, but by its labor force's productivity. He

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introduces familiar concepts of gross domestic product as a measure of national wealth, specialization and division of labor, mutual gain from trade, and market efficiency (also known as the concept of the invisible hand) in making his arguments valid (Smith, 1952). Traditional national accounts mostly misrepresent economic aggregates of wealth (Shaikh & Tonak, 1994). So, for better understanding of an economy a cross country wealth report could be the prime instrument to understand the performance of an economy. Since 2010, the Credit Suisse Research Institute's Global Wealth Report has been the leading reference on global household wealth. It contains the most comprehensive and up-to-date findings on global wealth across the entire wealth spectrum – from the very basis of the "wealth pyramid," capturing 3.2 billion adults with wealth below USD 10,000 to those at the apex of the wealth pyramid with USD 1 million or more that comprise less than 1 percent of the adult population but own 45 percent of household wealth. Global aggregate wealth increased by USD 14.0 trillion (4.6 percent) over the 12 months to mid-2018 to a total of USD 317 trillion, outperforming population growth. Wealth per adult increased by 3.2% to a record high of USD 63,100 per adult (O'Sullivan, 2018). Questions asked which countries are in the top wealthy positions? Which are in the bottom? How have the wealthy nations managed to do it and which are the factors determining it? All these questions are worth a thorough analysis and exploration. That is why, the current study is aiming at finding the answers of the above questions. In doing so, an extensive study inside into the relevant literature on this field is also required which will be done on the next section of discussion.

Following this section, firstly data and its analytical methods would be presented. Then results and discussion would be complemented. Finally, recommendations and conclusion have been added at the last section of this paper.

## Literature Review

Global Wealth Report 2018 of Credit Sussie shows that only China and United States of America has considerably increased their wealth of nations during 2009-2018. Other countries have a slow pace of growth in maximizing wealth. Why couldn't other countries keep up with those two countries? How were the cross-country efficiencies in wealth maximization? What are the factors driving these cross-country efficiencies in wealth maximization? The very matter worth examining. There are a number of techniques and models to measure technical efficiency, these are Total Factor Productivity (TFP), ratio of aggregate outputs to aggregate inputs (Van Beveren, 2012), Data Envelopment Analysis (DEA), measure productive efficiency of decision making units (DMUs), (Ray, 2004) and Stochastic Frontier Analysis (SFA), A stochastic component that describes random shocks affecting the production process is added using Cobb Douglas basic production function, (Aigner, Lovell, & Schmidt, 1977).

An analogy had been found in Karl Marx's Das Capital where he argued that capitalism is the individual (or corporate) attempt to accumulate more and more wealth, often by owning the means of production i.e. capital and labor as used in Cobb Douglas production function (Marx, 2007). Innovating firms yield lower average wage and lower capital intensity. (Bleaney, Wakelin, & Statistics, 2002) In Taiwan, electronics multinational firms bound with export only shows more technical efficiency than non-export oriented firms (Chen & Tang, 1987). Governance as an indicator shows inefficiency in productivity (Afonso & St. Aubyn, 2013). Productivity differs depending on the particular setting of the institution (Syverson, 2011). True random effects model that treats unobserved heterogeneity in national dataset generates more reasonable efficiency estimates (Danquah & Ouattara, 2018).

Cross country differences are attributable to strong unexplained country effects (Cowell, Karagiannaki, & McKnight, 2018). Neoclassical production function is often expanded to include various sets of additional variables in an attempt to explain economic growth with existing disagreement (Bos, Economidou, Koetter, & Kolari, 2010). Economic growth shows favorable effect from FDI in the presence of skilled labor (Wijeweera, Villano, & Dollery, 2010). In China, a study for the period of 1985-2008 on technical efficiency have found that the average output elasticity of labor is bigger than the two inputs capital and human capital (Zhou, Li, & Li, 2011). Stochastic Frontier Approach has further been used in the World Health Organization (WHO) for 191 countries (Greene, 2010). For measuring rice productivity Stochastic Frontier Approach, Data Envelopment Analysis and Total Factor Productivity Approach had been jointly used (Hossain, Kamil, Baten, & Mustafa, 2012). For measuring wealth efficiency which factors should be included in stochastic model is a major challenge for the current study. In finding the right variables the study that started with the Cobb Douglas production function i.e. output with the input of Labor and Capital (Cochran, 2013). Net primary income and secondary income have been advocated by Schmidt. (Schmidt, 2018) Exchange rate has been treated as an asset price (Fausten, 1989). Net foreign asset has been considered for current account status in typical web based encyclopedia. Also capital has been reported as the instrument to measure national assets. Effect of FDI on wealth had been studied on 317 Japanese firms (Alba, Wang, & Ho, 2007). Besides, consumption has a positive effect on wealth (Ackley, 1951). Wealth through the assistance of technology bring forth national income (Friday, 1920). The net value of the household sector is the balance of its net financial capital and tangible (non-financial) wealth. Net financial worth is the association between financial assets and financial liabilities. In savings accounts, bonds and pension funds, financial assets are included. Financial liabilities include loans secured against land, mostly residential mortgages, and unsecured debts such as overdrafts and unpaid credit card balances. Non-financial wealth primarily includes the value of property and building assets in the industry (Garratt, 2013). Greenwood–Hercowitz–Huffman preferences eliminate wealth effect on labor supply (Dmitriev & Roberts, 2012a).

The imputed net value variable of PSID that includes all components of measured assets. These asset elements are: property values; residential mortgages; financial assets held in portfolios, savings accounts, money market accounts, deposit certificates, government savings bonds, treasury bills, and so on; financial assets held in securities, mutual funds, and investment trusts, Supplementary financial assets, such as bond funds, life insurance capital, valuable savings, trust or property rights; farm and business ownership;

real estate; cars, motor homes, trucks, vessels, trailers and others; retirement wealth held in private annuities or IRAs; and other debt, including credit card debt, student loans, medical bills, legal bills, and family loans (Pfeffer & Griffin, 2017).

Savings generate levels of accumulated wealth (Caballero, 1991). Household obtain wealth from two sources either they earn it or receive it from others (Gale & Scholz, 1994). Welfare of an economy should include comparisons of wealth (Dasgupta & MÄLer, 2000). University of Michigan has showed ways for improving wealth variables in data collection process as well as in data processing algorithms (Pfeffer & Griffin, 2017). Wealth in the 21st century must be reported net of depreciation in fossil fuels, minerals, and forest produced net national saving rate and long run growth (Barbier, 2017). Study regarding accounting for the determinants of wealth concentration have found that labor income differences are the most relevant source of wealth deviation for most households (Kaymak, Leung, & Poschke, 2018). There is stable association between non-durables consumption, labor income and aggregate wealth (Tan & Voss, 2003). The Luxembourg Wealth Study (LWS) had provided basis for comparative research on household net worth, portfolio composition and wealth distribution. According to LWS net worth is equal to Assets Plus Non-Financial Assets less liabilities (Sierminska, Brandolini, & Smeeding, 2006).

Based on the above discussion, it is identified that wealth is important to measure for an economy to understand its performance. Also, study regarding the efficiency in wealth maximization as well as the determinants of this efficiency require attention. Identification of key variables, as discussed above, in determining wealth efficiency may further be analyzed to discover the most common determinants of wealth maximization efficiency.

Besides GDP as the main indicator to understand the performance of an economy, how wealth maximization can be more important instrument to understand an economy is the main research question of the study. Traditionally, the performance of a company is better measured through the wealth maximization not by the profit maximization. It is pushing the evaluation of the performance of an economy through the wealth maximization. So, it is needed to look into the wealth of the different nations of the world, then identify which countries are making more wealth and which are more efficient in doing so in compare to others. Also, the factors contributing to the wealth efficiency of a nation are needed to be identified to discover the reasons to be more efficient. Further analysis to narrow down the main determinants of this efficiency is also required to be done. Which will bring forth the key determinants out of the significant variables. All these are aimed at the current study and should follow a systematic method which is described in the following sections.

## Research and Methodology

To attain the objective of the research, the current study had been conducted based on secondary data. The sources of these data were different databases of the world. Like world development indicator, Credit Sussie Global Wealth report, World Health Organization (WHO) and many other sources. These databases had been accessed through internet. Then data had been corrected, converted and arranged in desired layout to analyze. Explorative study had been conducted based on the following data and methods:

### Data

Secondary dynamic panel data had been collected for 106 countries of the world for the years 2009-2018 mainly from two sources firstly from Credit Suisse AG, main dependent cross country wealth data, secondly from World Development Indicators of World Bank, the other independent variables data. Data is about 106 countries, 10 years, 21 variables. As these data were presented in different units of currency and figures, data correction had been done to harmonize the data for cross analysis. It had first been log normalized for analyzing thorugh the stochastic frontier. Then, the data had been first degree differentiated for neutralizing the time varying heteroscedasticity problem. Data were firstly in million-dollar figures, some were in billion dollars' figure, some were in local currency figure, some were in percentile figure, some were in ratio figure. All these data had been converted into billion dollars for all the absolute figure variables while percentile and ratio data had been converted into non-decimal figures. After converting and shaping the data in desired manner, they had been used and analyzed in the following manner:

#### Analysis

A composite step by step model-based study had been conducted on the above data. These steps are:

i) *Stochastic Frontier Analysis (SFA):* SFA method had been used to identify the cross-country wealth efficiency. The efficiency value has been derived from the SFA.

ii) *Generalized Method of Moments (GMM):* Multivariate regression methods had been used to identify significant explanatory variables which can explain the reasons for cross country efficiency in wealth maximization. These includes Driscoll Kraay (DK), Two stage least square (2SLS) and Generalized Method of Moments (GMM).

iii) *Principal Variable Analysis (PVA):* As multiple SFA models with different co-variances came up with non-identical explanatory variables a variable reduction technique has been used to identify the principal variables which were true across all the models.

Firstly, stochastic frontier model has been used with different covariates according to relevant literatures. This model has found out the relationship of wealth maximization outputs with labor, capital and land. Different covariates like Gross Domestic Product in current USD, Gross Domestic Product at Purchasing Power Parity USD, Net Foreign Assets and Personal Remittance Received, have been used with labor, capital and land variables to find out the relationships of these variables with efficiency of wealth maximization. After that for each and every model (total 4 models) technical efficiency (te) variable has been predicted. Then, multi variate correlation with significantly related variables had been carried out. In the next step, multi variate regression model have been run with the significant variables for each and every model of SFA. Finally, main explanatory variables have been identified through principal variable analysis (PVA). Below, is the list of variables and constructs:

**Table 1:** The variables supported and discovered from the relevant literature

| Sl.no. | Variable | Proxy for construct | Unit | Definition | References |
|---|---|---|---|---|---|
| **1** | NW | Net Wealth | Billion USD | Aggregate household net wealth of a nation | (O'Sullivan, 2018) |
| **2** | Labor | Total Labor | Numeric | Total number of labor employed in a year | (Dmitriev & Roberts, 2012a) |
| **3** | Land | Total Land Area | Square Kilometer | Total geographical area of a nation | (Durand, 2008) |
| **4** | GCF | Gross Capital Formation | Billion USD | Total Gross Capital formed in a fiscal year | (Kaymak et al., 2018) |
| **5** | GDPcu | Gross Domestic Product in current USD | Billion USD | Total monetary value of goods and services produced in a year in current USD | (Parente & Prescott, 1993) |
| **6** | GDPppp | Gross Domestic Product in Purchasing Power Parity USD | Billion USD | Total monetary value of goods and services produced through purchasing parity evaluation in USD | (Parente & Prescott, 1993) |
| **7** | te | Technical Efficiency | Range from 0 to 1 | Calculated through Stochastic Frontier Analysis | (Greene, 2010) |
| **8** | L.te | Lagged Technical Efficiency | Range from 0 to 1 | Calculated on year lag of Technical Efficiency as regressor | (Chen & Tang, 1987) |
| **9** | NFA | Net Foreign Assets | Billion USD | Total Net Foreign Assets inflow in a fiscal year | Investopedia |
| **10** | PRR | Personal Remittance Received | Billion USD | Total personal remittance received in a fiscal year | (Gale & Scholz, 1994) |
| **11** | Ex | Export | Billion USD | Total export in a fiscal year | (Chen & Tang, 1987) |
| **12** | NFAC | Net Financial Account | Billion USD | Total value of Financial Accounts in a fiscal year | (Garratt, 2013) |
| **13** | NSI | Net Secondary Income | Billion USD | Total Net secondary income earned in a fiscal year | (Dasgupta & MÄLer, 2000) |
| **14** | CPI | Consumer Price Index | Base Year 2010 = 100 USD | The aggregate price level of goods and services in a fiscal year | (Rosenthal, 2018) |
| **15** | NPI | Net Primary Income | Billion USD | Total net primary income made in a fiscal year | (Friday, 1920) |
| **16** | Im | Import | Billion USD | Total import volume in a fiscal year | (Chen & Tang, 1987) |
| **17** | ER | Exchange Rate | Numeric Local Currency | Average exchange rate of local currency against USD | (Wang, Morley, & Ordóñez, 2016) |
| **18** | RRI | Reserve and Related Items | Billion USD | Total value of reserves and related items in a fiscal year | (Alberola & Serena, 2008) |
| **19** | BM | Broad Money | Billion USD | Total broad money M2 circulated in a fiscal year | (Baharumshah & Soon, 2015) |
| **20** | DC | Domestic Credit | Billion USD | Total value of domestic credit in a fiscal year | (Agayev, 2019) |
| **21** | GS | Gross Savings | Billion USD | Total value of gross savings in a fiscal year | (De Nardi & Fella, 2017) |

## Models and Hypotheses

In order to achieve the goal of the study a systematic model based analysis had been carried out. At the very first, stochastic frontier approach had been used to come up with the efficiency variable of wealth. Later, this efficiency variable has been used as the dependent variable in multi variate robust models. In the next part functional relationship of the variables have been shown. Firstly, for stochastic model and then for multi variate regression models.

***Stochastic Frontier Analysis (SFA model) for predicting technical efficiency variables:*** The use of production function in stochastic frontier model had been refined to estimate the efficiency and disturbance term with maximum likelihood method (Aigner et al., 1977). Based on their paper, the typical functional relationships among the variables under SFA model is:

$$lnNW_{it} = f(L_{it};\ Land_{it}, K_{it}\ ) + (v_{it} - u_{it}) = f(L_{it};\ Land_{it}, K_{it}) + \varepsilon_{it} \dots \dots \dots \dots \dots \dots (1)$$

Here, Output ($Y_{it}$) is the Net wealth in country i and at time t indicating stochastic output in country i and at time t, $L_{it}$ is total labor in country i and at time t, $K_{it}$ is the gross capital formation in country i and at time t, $v_{it}$-$u_{it}$ is the error vector where $v_{it}$ is the normal disturbance and $u_{it}$ is the technical inefficiency. This very model had been used in a study of economic growth in OECD countries. (de la Fuente-Mella, Vallina-Hernandez, & Fuentes-Solís, 2019). Relevant hypotheses on the above variables are as follows:

**Table 2:** Relevant hypotheses

| No. | Hypotheses | References |
|---|---|---|
| $H_1$ | There is significant positive relationship between net wealth and Labor | (Mustre-del-Río, 2015) |
| $H_2$ | There is significant positive relationship between net wealth and Capital | (Mihalyi & Szelenyi, 2017) |
| $H_3$ | There is significant negative relationship between net wealth and Land | (Ceddia, 2019) |
| $H_4$ | There is significant positive relationship between wealth efficiency and GDPcu, GDPppp, NFA and PRR | (Carroll & Jeanne, 2009; Garip, 2014; Víctor Raúl López, José Luis Alfaro, & Peña, 2011) |

***a.*** *Multi variate regression models (OLS, FE, DK, 2SLS, GMM models) for identification of determinants:*

$$te_{it} = f(\ L.te_{it,}\ Ex_{it}\ NFAC_{it}\ NSI_{it}\ ER_{it}\ CPI_{it}\ NPI_{it}\ BM_{it}\ \ RRI_{it}\ Im_{it}\ GS_{it}\ GDPcu_{it}) + \varepsilon_{it} \dots \dots \dots \dots \dots \dots (1)$$

Here, L.te is Lagged dependent variable, Ex is Export, NFAC is net financial account, NSI is Net secondary income, ER is Exchange Rate, CPI is Consumer Price Index, NPI is Net Primary Income, BM is Broad Money, RRI is Reserve and related items, Im is Import, GS is Gross Savings, GDPcu is GDP in current USD. Relevant hypotheses on the above variables are as follows:

**Table 3:** Relevant hypotheses

| No. | Hypotheses | References |
|---|---|---|
| $H_5$ | There is significant negative relationship between wealth maximizing technical efficiency and L.te (lagged), ER, CPI, NPI, BM, Im | (Gholipour Fereidouni, Gholipour Fereidouni, Tajaddini, & Tajaddini, 2017; Joseph & Kiviet, 2005; Trevan, 2016; Wang et al., 2016) |
| $H_6$ | There is significant positive relationship between wealth maximizing technical efficiency and Ex, DC, NFAC, NSI, RRI, GDPcu | (Alberola & Serena, 2008; Di Gioacchino, Ginebri, & Sabani, 2008; Dmitriev & Roberts, 2012b; Franzini et al., 2016) |

## Result and Discussion

After collection of the data, it has been used in step by step manner. Firstly, stochastic frontier analysis had been carried out with multiple covariates. These are GDPcu, GDPppp, NFA and PRR. All these variables have been logged and first order differenced for ensuring normality of the data. After that multivariate partial regression model has been run for each and every technical efficiency (te) variables predicted by every stochastic frontier model. Then, nature of relationship of the explanatory variables have been examined for every model. With minor discrepancies, most of the variables have found to be consistent in their nature of relationship with technical efficiency. A cross examination and matching has been observed for every regression model to find out the common variables found in these models. Finally, principal variables analysis (PVA) has been carried out to identify the common variables across the models. First, collected data has been summarized in the following table:

**Table 4:** Data summary

| Variable | Obs | Mean | Std.Dev. | Min | Max |
|---|---|---|---|---|---|
| ID | 1060 | 53.5 | 30.613 | 1 | 106 |
| Year | 1060 | 2013.5 | 2.874 | 2009 | 2018 |
| NW | 1060 | 1869.637 | 8791.181 | .12 | 98154 |
| BM | 1060 | 631.253 | 2668.532 | .005 | 27100.06 |
| CPI | 1060 | 119.02 | 27.71 | 86.609 | 382.501 |
| CAB | 1060 | -.798 | 52.899 | -490.991 | 304.164 |
| DC | 1060 | 53.285 | 46.418 | 2.66 | 233.211 |
| Ex | 1060 | 124.757 | 330.356 | .044 | 2651.01 |
| GDPcu | 1060 | 520.498 | 2005.045 | .318 | 20494.1 |
| GDPppp | 1060 | 785.807 | 2591.23 | .485 | 25361.74 |
| GCF | 1060 | 138.888 | 564.161 | .022 | 6022.374 |
| GS | 1060 | 140.219 | 564.576 | -1.675 | 6159.84 |
| Im | 1060 | 125.372 | 350.382 | .219 | 3128.992 |
| Inf | 1060 | 4.343 | 4.529 | -7.732 | 48.7 |
| Labor | 1060 | 25400000 | 9000000 | 38210 | 787000000 |
| Land | 1060 | 903000 | 226000 | 390 | 1.64e+07 |
| NFAC | 1060 | -2.079 | 49.078 | -525.997 | 264.704 |
| NFA | 1060 | 84.54 | 407.338 | -457.057 | 4684.2 |
| NPI | 1060 | -.263 | 28.825 | -79.604 | 253.981 |
| NSI | 1060 | .189 | 14.301 | -124.023 | 70.075 |
| ER | 1060 | 573.181 | 1568.268 | .276 | 14236.94 |
| PRR | 1060 | 3.447 | 8.021 | 0 | 78.79 |
| RRI | 1060 | 3.951 | 35.007 | -443.625 | 471.659 |
| Te | 1060 | .842 | .146 | .182 | .99 |

Table 4 show that on an average every country has a net wealth of 1869 billion USD. Every country mean import is about 125 billion USD. Mean export is about 125 billion USD. Logically, import average is identical with export average. The average GDP in current US dollar is 520 billion USD per country. Total labor is about 25400000 persons. While average land area is about 903000 square kilometers. The gross capital is about 138 billion USD per country. Average price index is 119 for every country of the world. The technical efficiency is 84% on an average for each country with lowest efficiency of 18% and with highest of 99%.

**Results of Stochastic Frontier Analysis (for predicting Technical Efficiency):** In this section, the stochastic frontier result for four different models with four different covariates have been reported. These covariates for models are GDPcu, GDPppp, NFA and PRR respectively. Relevant efficiency have been reported through the Mu.

**Table 5:** Stochastic Frontier Analysis results for four different models with different covariates

| | (Model 1) lnNW | (Model 2) lnNW | (Model 3) lnNW | (Model 4) lnNW |
|---|---|---|---|---|
| lnGCF | 0.266*** | 1.891*** | 0.267*** | 0.271*** |
| | (0.003) | (0.096) | (0.000) | (0.000) |
| lnLand | | 1.330*** | -2.200*** | -1.045*** |
| | | (0.140) | (0.000) | (0.000) |
| lnLabor | 0.533*** | 0.859*** | 0.516*** | 0.545*** |
| | (0.004) | (0.312) | (0.000) | (0.000) |
| Year | 0.014*** | -0.024*** | 0.012*** | 0.011*** |
| | (0.000) | (0.002) | (0.000) | (0.000) |
| **Mu:lnGDPcu** | **-4.723**** | | | |
| | **(1.835)** | | | |
| **Mu:lnGDPppp** | | **-5.202** | | |
| | | **(0.000)** | | |
| **Mu:lnNFA** | | | **-0.501**** | |
| | | | **(0.253)** | |
| **Mu:lnPRR** | | | | **-0.579**** |
| | | | | **(0.236)** |
| Obs. | 1060 | 1060 | 1060 | 1060 |

Standard errors are in parenthesis
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

The stochastic analysis shows that there is significant positive relationship of Capital and Labor with wealth maximization while a significant negative relationship with land area. Indicating more and more capital and labor engagement bring about more and more wealth where as additional land ownership of a country is undermining the efficiency of wealth maximization of a country. It means, additional land ownership makes a country inefficient. Besides, all the covariates (lnGDPcu, lnGDPppp, lnNFA, lnPRR) show significant positive relationship with the wealth maximizing efficiency. Technical efficiency dependent variable (te) for GMM analysis had been predicted from each and every stochastic frontier model. The correlation matrices for these four models with four different covariates are presented in next section:

**Table 6:** Pairwise correlations matrix for Wealth Maximization with GDPcu covariate (significant variables with less than 90% correlation reported)

| Variables | L.dte | dte | dlnEx | dlnNFAC | dlnNSI | dlnCPI | dlnNPI | dlnIm |
|---|---|---|---|---|---|---|---|---|
| Dte | 1.000 | | | | | | | |
| L.dte | -0.101*** | 1.000 | | | | | | |
| dlnEx | 0.109*** | 0.078** | 1.000 | | | | | |
| dlnNFAC | 0.086*** | -0.021 | 0.004 | 1.000 | | | | |
| dlnNSI | 0.093*** | -0.075** | -0.007 | -0.034 | 1.000 | | | |
| dlnCPI | -0.118*** | -0.225*** | 0.052* | 0.028 | 0.040 | 1.000 | | |
| dlnNPI | -0.070** | 0.060* | -0.146*** | 0.061* | 0.024 | -0.009 | 1.000 | |
| dlnIm | 0.032 | 0.161*** | 0.863*** | -0.079** | 0.030 | 0.040 | -0.171*** | 1.000 |

**** p<0.01, ** p<0.05, * p<0.1*

The above table shows little association between the variables indicating low chance of endogeneity. This first model reports that technical efficiency (dte) can be explained by L.dte, dlnEx, dlnNFAC, dlnNSI, dlnCPI, dlnNPI, dlnIm. Also, the results show significance at least at .10 level for all the variables. No variable is showing association over .90 level.

**Table 7:** Pairwise correlations matrix for Wealth Maximization with GDPppp covariate (significant variables with less than 90% correlation reported)

| Variables | L.dte | Dte | dlnEx | dlnER | dlnRRI | dlnBM | dlnIm | dlnGDPcu | dlnGS |
|---|---|---|---|---|---|---|---|---|---|
| Dte | 1.000 | | | | | | | | |
| L.dte | -0.134*** | 1.000 | | | | | | | |
| dlnEx | -0.097*** | -0.020 | 1.000 | | | | | | |
| dlnER | 0.083*** | -0.075** | -0.102*** | 1.000 | | | | | |
| dlnRRI | -0.035 | 0.036 | 0.026 | 0.032 | 1.000 | | | | |
| dlnBM | -0.160*** | 0.018 | 0.148*** | -0.898*** | -0.039 | 1.000 | | | |
| dlnIm | -0.247*** | -0.045 | 0.863*** | -0.126*** | 0.020 | 0.172*** | 1.000 | | |
| dlnGDPcu | -0.299*** | -0.004 | 0.368*** | -0.362*** | 0.007 | 0.443*** | 0.346*** | 1.000 | |
| dlnGS | -0.184*** | 0.135*** | 0.048 | -0.045 | -0.037 | 0.054* | 0.080** | 0.151*** | 1.000 |

**** p<0.01, ** p<0.05, * p<0.1*

The table 7 shows little association between the variables indicating low chance of endogeneity. This second model also reports that technical efficiency (dte) can be explained by L.dte, dlnEx, dlnER, dlnRRI, dlnBM, dlnIm and dlnGDPcu. Similarly, the results show significance at least at .10 level for all the variables. No variable is showing association over .90 level.

**Table 8:** Pairwise correlations matrix for Wealth Maximization with NFA covariate (significant variables with less than 90% correlation reported)

| Variables | L.dte | Dte | dlnEx | dlnDC | dlnNFAC | dlnNSI | dlnER | dlnCPI | dlnNPI | dlnBM | dlnIm | dlnGDPcu |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dte | 1.000 | | | | | | | | | | | |
| L.dte | -0.101*** | 1.000 | | | | | | | | | | |
| dlnEx | 0.108*** | 0.077** | 1.000 | | | | | | | | | |
| dlnDC | -0.033 | 0.129*** | -0.090*** | 1.000 | | | | | | | | |
| dlnNFAC | 0.086*** | -0.021 | 0.004 | -0.053* | 1.000 | | | | | | | |
| dlnNSI | 0.094*** | -0.075** | -0.007 | 0.046 | -0.034 | 1.000 | | | | | | |
| dlnER | -0.209*** | -0.152*** | -0.102*** | 0.060* | 0.050 | 0.008 | 1.000 | | | | | |
| dlnCPI | -0.119*** | -0.226*** | 0.052* | -0.104*** | 0.028 | 0.040 | 0.204*** | 1.000 | | | | |
| dlnNPI | -0.070** | 0.060* | -0.146*** | 0.009 | 0.061* | 0.024 | 0.012 | -0.009 | 1.000 | | | |
| dlnBM | 0.158*** | 0.165*** | 0.148*** | 0.045 | -0.095*** | -0.001 | -0.898*** | -0.060* | -0.016 | 1.000 | | |
| dlnIm | 0.031 | 0.161*** | 0.863*** | 0.029 | -0.079** | 0.030 | -0.126*** | 0.040 | -0.171*** | 0.172*** | 1.000 | |
| dlnGDPcu | 0.295*** | 0.285*** | 0.368*** | -0.128*** | -0.008 | -0.019 | -0.362*** | -0.018 | -0.054* | 0.443*** | 0.346*** | 1.000 |

**** p<0.01, ** p<0.05, * p<0.1*

The table 8 shows little association between the variables indicating low chance of endogeneity. This third model also reports that technical efficiency (dte) can be explained by more variables than model 1 and 2, these are L.dte, dlnEx, dlnDC, dlnNFAC, dlnNSI, dlnER, dlnCPI, dlnNPI, dlnBM, dlnIm and dlnGDPcu.

**Table 9:** Pairwise correlations matrix for Wealth Maximization with PRR covariate (significant variables with less than 90% correlation reported)

| Variables | L.dte | Dte | dlnEx | dlnDC | dlnNFAC | dlnNSI | dlnER | dlnCPI | dlnNPI | dlnBM | dlnIm | dlnGDPcu |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dte | 1.000 | | | | | | | | | | | |
| L.dte | -0.103*** | 1.000 | | | | | | | | | | |
| dlnEx | 0.107*** | 0.077** | 1.000 | | | | | | | | | |
| dlnDC | -0.033 | 0.129*** | -0.090*** | 1.000 | | | | | | | | |
| dlnNFAC | 0.086*** | -0.021 | 0.004 | -0.053* | 1.000 | | | | | | | |
| dlnNSI | 0.094*** | -0.075** | -0.007 | 0.046 | -0.034 | 1.000 | | | | | | |
| dlnER | -0.208*** | -0.152*** | -0.102*** | 0.060* | 0.050 | 0.008 | 1.000 | | | | | |
| dlnCPI | -0.119*** | -0.226*** | 0.052* | -0.104*** | 0.028 | 0.040 | 0.204*** | 1.000 | | | | |
| dlnNPI | -0.070** | 0.060* | -0.146*** | 0.009 | 0.061* | 0.024 | 0.012 | -0.009 | 1.000 | | | |
| dlnBM | 0.157*** | 0.165*** | 0.148*** | 0.045 | -0.095*** | -0.001 | -0.898*** | -0.060* | -0.016 | 1.000 | | |
| dlnIm | 0.030 | 0.160*** | 0.863*** | 0.029 | -0.079** | 0.030 | -0.126*** | 0.040 | -0.171*** | 0.172*** | 1.000 | |
| dlnGDPcu | 0.292*** | 0.283*** | 0.368*** | -0.128*** | -0.008 | -0.019 | -0.362*** | -0.018 | -0.054* | 0.443*** | 0.346*** | 1.000 |

**** p<0.01, ** p<0.05, * p<0.1*

The table 9 shows little association between the variables indicating low chance of endogeneity. This fourth model reports alike model 3 that technical efficiency (dte) can be explained like model 3, these are L.dte, dlnEx, dlnDC, dlnNFAC, dlnNSI, dlnER, dlnCPI, dlnNPI, dlnBM, dlnIm and dlnGDPcu. Like the GDPcu covariates, all the results show significance at least at .10 level for all the variables. No variable is showing association over .90 level.

**Table 10:** Determinants of wealth maximizing technical efficiency for with GDPcu covariate

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | OLS | FE | DK | 2sls | SGMM | LGMM |
| L.dte | -0.130*** | -0.201*** | -0.130*** | -0.130*** | -0.075** | -0.070** |
| | (0.034) | (0.036) | (0.031) | (0.034) | (0.034) | (0.029) |
| dlnEx | 0.161*** | 0.168*** | 0.161*** | 0.161*** | 0.185*** | 0.172*** |
| | (0.027) | (0.028) | (0.015) | (0.027) | (0.044) | (0.041) |
| dlnNFAC | 0.005** | 0.005*** | 0.005* | 0.005** | 0.004** | 0.004** |
| | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| dlnNSI | 0.016*** | 0.016*** | 0.016* | 0.016*** | 0.015** | 0.014** |
| | (0.005) | (0.005) | (0.008) | (0.005) | (0.007) | (0.006) |
| dlnCPI | -0.468*** | -0.532*** | -0.468*** | -0.468*** | -0.378*** | -0.352*** |
| | (0.079) | (0.124) | (0.083) | (0.079) | (0.093) | (0.086) |
| dlnNPI | -0.005** | -0.004* | -0.005*** | -0.005** | -0.006** | -0.006** |
| | (0.002) | (0.002) | (0.001) | (0.002) | (0.002) | (0.002) |
| dlnIm | -0.087*** | -0.086*** | -0.087** | -0.087*** | -0.103** | -0.096** |
| | (0.031) | (0.033) | (0.027) | (0.031) | (0.048) | (0.045) |
| _cons | 0.015*** | 0.017*** | 0.015 | 0.015*** | 0.011** | 0.011** |
| | (0.005) | (0.006) | (0.009) | (0.005) | (0.005) | (0.004) |
| Obs. | 848 | 848 | 848 | 848 | 848 | 848 |
| **F-Value** | **14.61*** ** | | | | | |
| **Wald Chi-square** | **41.94*** ** | | | | | |
| **AR(2)** | **.536** | | | | | |
| **Sargan Statistics** | **.309** | | | | | |
| **Hansen Statistics** | **.521** | | | | | |
| **Observations** | **848** | | | | | |

Standard errors are in parenthesis

**** p<0.01, ** p<0.05, * p<0.1*

### Results of cross-country determinants of efficiency in Wealth Maximization

In this section, four stochastic frontier models generated technical efficiency variables have been regressed with robust models to identify the determinants of this efficiency.

Table 10 reports the determinants of efficiency (for GDPcu covariate) in wealth maximization for first SFA model, which shows that L.dte, dlnCPI, dlnNPI and dlnIm have significant negative relationship with wealth efficiency while significant positive relationship with dlnEx, dlnNFAC and dlnNSI. All results are identical in multiple regression models OLS, Fixed Effect, Driscoll-Kraay, Two Stage Least square, Short-run Generalized Methods of Moments and Long-run Generalized methods of moments.

The findings show that the lagged dependent variable (L.dte) is important ($p<0.01$), suggesting the negative impact of the efficiency level of the past year. Three control variables, consumer price index, net primary income and import remain negative and significant ($p < 0.01$) across the five models. Other variables like export, net secondary income and net financial account show positive and significant relationship with technical efficiency. It suggests that countries with larger export, net secondary income and net financial account and lower inflation, import, net primary income are benefited in wealth efficiency. The negligible Sargan test statistics ($p<0.05$) indicate the residuals are not associated with the instrumental variable (IV). In addition, the Hansen test supports the null hypothesis of instrument validity ($p<0.05$), suggesting that the instruments are exogenous and appropriate. Moreover, the model is free from second-order correlation indicating no serial correlation. So, the overall model is valid and relevant hypotheses are valid.

**Table 11:** Determinants of wealth maximizing technical efficiency with GDPppp covariate

| | (1) OLS | (2) FE | (3) DK | (4) 2sls | (5) SGMM | (6) LGMM |
|---|---|---|---|---|---|---|
| L.dte | -0.148*** | -0.205*** | -0.148 | -0.148*** | -0.137* | -0.121** |
| | (0.030) | (0.032) | (0.080) | (0.030) | (0.080) | (0.062) |
| dlnEx | 0.151*** | 0.165*** | 0.151*** | 0.151*** | 0.123** | 0.108** |
| | (0.028) | (0.030) | (0.038) | (0.028) | (0.056) | (0.050) |
| dlnER | -0.168*** | -0.239*** | -0.168* | -0.168*** | -0.121** | -0.106** |
| | (0.042) | (0.053) | (0.077) | (0.042) | (0.058) | (0.050) |
| dlnRRI | -0.002 | -0.001 | -0.002*** | -0.002 | -0.003*** | -0.003*** |
| | (0.001) | (0.001) | (0.000) | (0.001) | (0.001) | (0.001) |
| dlnBM | -0.159*** | -0.216*** | -0.159* | -0.159*** | -0.110** | -0.096** |
| | (0.042) | (0.052) | (0.071) | (0.042) | (0.055) | (0.047) |
| dlnIm | -0.318*** | -0.336*** | -0.318*** | -0.318*** | -0.285*** | -0.250*** |
| | (0.030) | (0.031) | (0.033) | (0.030) | (0.060) | (0.051) |
| dlnGDPcu | -0.189*** | -0.186*** | -0.189*** | -0.189*** | -0.168* | -0.148* |
| | (0.045) | (0.048) | (0.048) | (0.045) | (0.089) | (0.081) |
| dlnGS | -0.018*** | -0.014*** | -0.018*** | -0.018*** | -0.022** | -0.019** |
| | (0.005) | (0.005) | (0.003) | (0.005) | (0.011) | (0.009) |
| _cons | 0.017*** | 0.023*** | 0.017** | 0.017*** | 0.010* | 0.009* |
| | (0.005) | (0.006) | (0.005) | (0.005) | (0.006) | (0.006) |
| Obs. | 848 | 848 | 848 | 848 | 848 | 848 |
| **F-Value** | **35.14*** ** | | | | | |
| **Wald Chi-square** | **83.84*** ** | | | | | |
| **AR(2)** | **.785** | | | | | |
| **Sargan Statistics** | **.001** | | | | | |
| **Hansen Statistics** | **.139** | | | | | |
| **Observations** | **848** | | | | | |

**** p<0.01, ** p<0.05, * p<0.1*

Table 11 reports the determinants of efficiency (for GDPppp covriate) in wealth maximization for second SFA model, which shows that L.dte, dlnER, dlnRRI, dlnBM, dlnGDPcu, dlnGS and dlnIm have significant negative relationship with wealth efficiency while significant positive relationship only with dlnEx. All results are identical in multiple regression models OLS, Fixed Effect, Driscoll-Kraay, Two Stage Least square, Short-run Generalized Methods of Moments and Long-run Generalized methods of moments.

The findings show that the lagged dependent variable (L.dte) is important ($p<0.01$), suggesting the negative impact of the efficiency level of the past year. Six control variables exchange rate, reserves and related items, broad money, import and GDP at current USD remain negative and significant (p < 0.01) across the five models. Only variable export show positive and significant relationship with technical efficiency. It suggests that countries with larger export and lower exchange rate, reserves and related items, broad money, import and GDP at current USD are benefited in wealth efficiency. The negligible Sargan test statistics (p<0.05) indicate the residuals are not associated with the instrumental variable (IV). In addition, the Hansen test supports the null hypothesis of instrument validity (p<0.05), suggesting that the instruments are exogenous and appropriate. Moreover, the model is free from second-order correlation indicating no serial correlation. So, the overall model is valid and relevant hypotheses are valid.

**Table 12:** Determinants of wealth maximizing technical efficiency with NFA covariate

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | OLS | FE | DK | 2sls | SGMM | LGMM |
| L.dte | -0.224*** | -0.283*** | -0.224*** | -0.224*** | -0.193*** | -0.161*** |
| | (0.033) | (0.035) | (0.041) | (0.033) | (0.032) | (0.023) |
| dlnEx | 0.058** | 0.057* | 0.058* | 0.058** | 0.086** | 0.072** |
| | (0.029) | (0.031) | (0.029) | (0.029) | (0.039) | (0.034) |
| dlnDC | 0.083*** | 0.048 | 0.083** | 0.083*** | 0.079* | 0.067* |
| | (0.031) | (0.036) | (0.032) | (0.031) | (0.043) | (0.037) |
| dlnNFAC | 0.005** | 0.005** | 0.005* | 0.005** | 0.004* | 0.003* |
| | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| dlnNSI | 0.016*** | 0.016*** | 0.016** | 0.016*** | 0.015*** | 0.013*** |
| | (0.004) | (0.005) | (0.005) | (0.004) | (0.005) | (0.004) |
| dlnER | -0.204*** | -0.231*** | -0.204** | -0.204*** | -0.203*** | -0.171*** |
| | (0.045) | (0.053) | (0.070) | (0.045) | (0.069) | (0.058) |
| dlnCPI | -0.300*** | -0.370*** | -0.300*** | -0.300*** | -0.252** | -0.211** |
| | (0.079) | (0.118) | (0.074) | (0.079) | (0.107) | (0.089) |
| dlnNPI | -0.004** | -0.003* | -0.004*** | -0.004** | -0.005* | -0.004* |
| | (0.002) | (0.002) | (0.000) | (0.002) | (0.003) | (0.002) |
| dlnBM | -0.158*** | -0.179*** | -0.158** | -0.158*** | -0.145** | -0.122** |
| | (0.045) | (0.052) | (0.055) | (0.045) | (0.060) | (0.050) |
| dlnIm | -0.178*** | -0.174*** | -0.178*** | -0.178*** | -0.223*** | -0.187*** |
| | (0.031) | (0.033) | (0.020) | (0.031) | (0.038) | (0.034) |
| dlnGDPcu | 0.437*** | 0.429*** | 0.437*** | 0.437*** | 0.462*** | 0.387*** |
| | (0.046) | (0.050) | (0.040) | (0.046) | (0.067) | (0.054) |
| _cons | 0.014*** | 0.021*** | 0.014** | 0.014*** | 0.011** | 0.009** |
| | (0.005) | (0.007) | (0.006) | (0.005) | (0.005) | (0.004) |
| Obs. | 848 | 848 | 848 | 848 | 848 | 848 |
| **F-Value** | **22.70*** ** | | | | | |
| **Wald Chi-square** | **195.37*** ** | | | | | |
| **AR(2)** | **.874** | | | | | |
| **Sargan Statistics** | **.382** | | | | | |
| **Hansen Statistics** | **.452** | | | | | |
| **Observations** | **848** | | | | | |

**** p<0.01, ** p<0.05, * p<0.1*

Table 12 reports the determinants of efficiency (for net foreign asset covariate) in wealth maximization for third SFA model, which shows that L.dte, dlnER, dlnCPI, dlnNPI, dlnBM, and dlnIm have significant negative relationship with wealth efficiency while significant positive relationship with dlnEx, dlnDC, dlnNFAC, dlnNSI and dlnGDPcu. All results are identical in multiple regression models OLS, Fixed Effect, Driscoll-Kraay, Two Stage Least square, Short-run Generalized Methods of Moments and Long-run Generalized methods of moments.

The findings show that the lagged dependent variable (L.dte) is important (p<0.01), suggesting the negative impact of the efficiency level of the past year. Five control variables exchange rate, consumer price index, net primary income, broad money and import remain negative and significant (p < 0.01) across the five models. Five variables export, domestic credit, net financial account, net secondary income and GDP at current USD show positive and significant relationship with technical efficiency. It suggests that countries with larger export, domestic credit, net financial account, net secondary income, GDP at current USD and lower exchange rate, consumer price index, net primary income, broad money and import are benefited in wealth efficiency. The negligible Sargan test statistics ($p<0.05$) indicate the residuals are not associated with the instrumental variable (IV). In addition, the Hansen test supports the null hypothesis of instrument validity ($p<0.05$), suggesting that the instruments are exogenous and appropriate. Moreover, the model is free from second-order correlation indicating no serial correlation. So, the overall model is valid and relevant hypotheses are valid.

Table 13 reports the determinants of efficiency (for personal remmittance received covariate) in wealth maximization for fourth SFA model, which shows identical result like model 3 that L.dte, dlnER, dlnCPI, dlnNPI, dlnBM, and dlnIm have significant negative relationship with wealth efficiency while significant positive relationship with dlnEx, dlnDC, dlnNFAC, dlnNSI and dlnGDPcu. All results are identical in multiple regression models OLS, Fixed Effect, Driscoll-Kraay, Second Stage Least square, Short-run Generalized Methods of Moments and Long-run Generalized methods of moments.

**Table 13:** Determinants of wealth maximizing technical efficiency with PRR covariate

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | OLS | FE | DK | 2sls | SGMM | LGMM |
| L.dte | -0.224*** | -0.284*** | -0.224*** | -0.224*** | -0.193*** | -0.162*** |
| | (0.033) | (0.035) | (0.041) | (0.033) | (0.032) | (0.023) |
| dlnEx | 0.059** | 0.058* | 0.059* | 0.059** | 0.086** | 0.072** |
| | (0.029) | (0.031) | (0.029) | (0.029) | (0.039) | (0.033) |
| dlnDC | 0.083*** | 0.048 | 0.083** | 0.083*** | 0.079* | 0.066* |
| | (0.031) | (0.036) | (0.032) | (0.031) | (0.043) | (0.037) |
| dlnNFAC | 0.005** | 0.005** | 0.005* | 0.005** | 0.004* | 0.003* |
| | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| dlnNSI | 0.016*** | 0.016*** | 0.016** | 0.016*** | 0.015*** | 0.013*** |
| | (0.004) | (0.005) | (0.005) | (0.004) | (0.005) | (0.004) |
| dlnER | -0.206*** | -0.233*** | -0.206** | -0.206*** | -0.204*** | -0.171*** |
| | (0.045) | (0.054) | (0.070) | (0.045) | (0.069) | (0.058) |
| dlnCPI | -0.301*** | -0.370*** | -0.301*** | -0.301*** | -0.253** | -0.212** |
| | (0.079) | (0.118) | (0.073) | (0.079) | (0.107) | (0.089) |
| dlnNPI | -0.004** | -0.003* | -0.004*** | -0.004** | -0.005* | -0.004* |
| | (0.002) | (0.002) | (0.000) | (0.002) | (0.003) | (0.002) |
| dlnBM | -0.159*** | -0.180*** | -0.159** | -0.159*** | -0.146** | -0.122** |
| | (0.045) | (0.052) | (0.055) | (0.045) | (0.060) | (0.051) |
| dlnIm | -0.180*** | -0.176*** | -0.180*** | -0.180*** | -0.224*** | -0.188*** |
| | (0.031) | (0.033) | (0.020) | (0.031) | (0.038) | (0.034) |
| dlnGDPcu | 0.434*** | 0.428*** | 0.434*** | 0.434*** | 0.461*** | 0.386*** |
| | (0.046) | (0.050) | (0.040) | (0.046) | (0.067) | (0.054) |
| _cons | 0.015*** | 0.021*** | 0.015** | 0.015*** | 0.011** | 0.009** |
| | (0.005) | (0.007) | (0.006) | (0.005) | (0.005) | (0.004) |
| Obs. | 848 | 848 | 848 | 848 | 848 | 848 |
| **F-Value** | **22.63*** ** | | | | | |
| **Wald Chi-square** | **194.73*** ** | | | | | |
| **AR(2)** | **.865** | | | | | |
| **Sargan Statistics** | **.373** | | | | | |
| **Hansen Statistics** | **.447** | | | | | |
| **Observations** | **848** | | | | | |

*** p<0.01, ** p<0.05, * p<0.1*

The findings show that the lagged dependent variable (L.dte) is important (p<0.01), suggesting the negative impact of the efficiency level of the past year. Similar to the Five control variables exchange rate, consumer price index, net primary income, broad money and import remain negative and significant (p < 0.01) across the five models. Five variables export, domestic credit, net financial account, net secondary income and GDP at current USD show positive and significant relationship with technical efficiency. It suggests that countries with larger export, domestic credit, net financial account, net secondary income, GDP at current USD and lower exchange rate, consumer price index, net primary income, broad money and import are benefited in wealth efficiency. The negligible Sargan test statistics (p<0.05) indicate the residuals are not associated with the instrumental variable (IV). In addition, the Hansen test supports the null hypothesis of instrument validity (p<0.05), suggesting that the instruments are exogenous and appropriate. Moreover, the model is free from second-order correlation indicating no serial correlation. So, the overall model is valid and relevant hypotheses are valid.

## Hypotheses and results

**Table 14:** Result of the test of hypotheses are given below:

| No. | Hypotheses | Result |
|---|---|---|
| **$H_1$** | There is significant positive relationship between net wealth and Labor | Supported by all models |
| **$H_2$** | There is significant positive relationship between net wealth and Capital | Supported by all models |
| **$H_3$** | There is significant negative relationship between net wealth and Land | Supported by all models |
| **$H_4$** | There is significant positive relationship between wealth efficiency and GDPcu, GDPppp, NFA, PRR | Supported by all models |
| **$H_5$** | There is significant negative relationship between wealth maximizing technical efficiency and L.te (lagged), ER, CPI, NPI, BM, Im | Supported by all models |
| **$H_6$** | There is significant positive relationship between wealth maximizing technical efficiency and Ex, DC, NFAC, NSI, RRI, GDPcu | Supported by all models |

**Principal Variable Analysis (PVA):** As the determinants of efficiency in wealth maximization varies across models used in this study, the researchers had tried to analyze though the variable reduction technique on the significant determining variables in these models to get the common determinants across these models. Figure 1 shows the common variables analysis across the models.

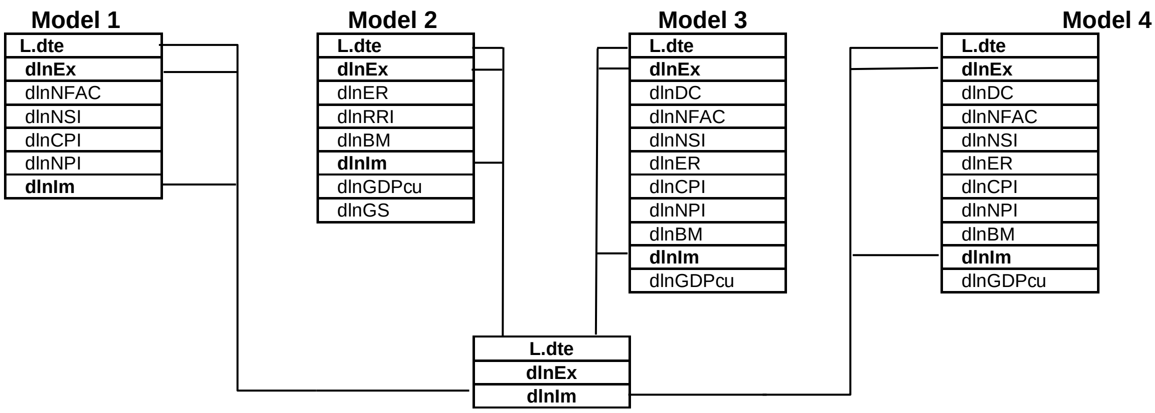


**Figure 1**: Common variables analysis across the models

Based on the above analysis L.dte , dlnEx and dlnIm variables have been found common across the models of the study. So, the key variables determining the efficiency in wealth maximization in cross countries of the world are lagged dependent variable (L.dte), Exports(dlnEx) and Imports(dlnIm). Lagged dependent variable i.e the efficiency of last year negatively influenced the efficiency of current year. Whereas export positively influence the efficiency across the countries of the world while imports negatively influence the efficiency.

#### Interpretation of the multi models-based findings and robustness check

Based on the analysis, it is discovered that all the significant variables identified in four different models showed identical nature of relationship with the dependent variables. Also the degree of relationships between the dependent and independent variables were closely identical. Indicating robustness in findings. Also, the nature and degree of relationship of these variables were similar in all robust models namely Fixed effect, Driscoll Kraay, Two stage least square, Generalized methods of moment models. All the hypotheses supported by these models. Which ultimately ensured the robustness of the findings.

**Recommendations**

Based on the findings of the study, it can be recommended that a country should put it concentration on increasing export as much as possible and decrease the imports to the extent possible to be efficient in maximizing its wealth. If a country can do so, it will emerge as a strong wealthy nation in near future as the study indicates. Policy makers of a country could be more aware on how they can be more efficient in generating wealth. Determinants of the wealth efficiency could be the major factors to be considered during policy formulation for a country. Import demotivating and export motivating strategies and policies will enable a nation to be more wealthy compare to others. Besides, a country should keep it in mind that it should continue its excellence in increasing its efficiency in wealth maximization as the past year's level of efficiency is negatively affecting the current year's efficiency. Other relevant variables which are impacting the wealth efficiency should also be considered sincerely.

## Conclusions

Overall, the study of 106 countries through a 10 years' dynamic panel data, have been a valuable finding to understand the economies of the world with respect to wealth and other major economic indicators. Alike the Cobb-Douglas proposition, efficiency of output depends mainly on labor and capital, the study had used these variables in finding out the efficiency in wealth maximization. After predicting the technical efficiency through the stochastic frontier model with different covariates, a further leap had been made to look into the causes behind this efficiency across the countries of the world. The study had found a number of significant variables in determining the efficiency of wealth maximization and the result varied across the models. So, the principal variable analysis had been done to find out the common variables across the used models in the study. Which found the lagged dependent variable, export and import are the main determinant of efficiency in wealth maximization across the countries of the world.

This paper had mainly contributed in two aspects: firstly, it has predicted and shown the technical efficiency in wealth maximization across the countries of the world and secondly it has scrutinized and identified the determinants of this efficiency through robust models (DC, 2SLS, GMM) and principal variable analysis.

*Academic Implications:* The academia would be complemented through the joint analysis of SFA and GMM model. This study will show how to use this two models jointly to come up with the determinants of efficiency.

*Economic Implications:* After establishing the finding of the study about how wealth maximization can be the better economic indicator than GDP, the economic arena would be assisted to think about the importance of wealth besides GDP. Also the concept of sustainable wealth efficiency will help in understanding the importance of environmental impact of development of a nation.

*Social Implications:* Society as a whole be benefited by the findings as it will create a sense of wealth rather production and profit which will lead to set up a normative view towards the development of a nation.

Future study may be conducted on finding out the most important determinants of wealth efficiency besides the variables identified by the study. Also, programming algorithms related studies may come forward to assist the development of global wealth index and wealth efficiency index. Further studies on measurement and valuation of cross-country wealth may be carried out to purify the existing literature regarding wealth measurement of a nation. Besides, studies of composite index of wealth alongside status index can also be developed. Global total wealth study may be done for finding out the fair share of every man on this earth. Wealth based gini-coefficient index can also be developed to understand the wealth inequality among the nations. Finally, the following inspirations may lead to better future researches: (i) *Factors affecting sustainable wealth maximization, (ii)Ranking of countries with efficiency index on wealth, (iii) Wealth accounting global body creation, (iv) Wealth standard setting, (v) Wealth status category creation.*

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